Response to comments from Scott Clardy
Department of Health and Senior Services
Received by letter; March 21, 2005

General Comments:

- *As this guidance document will apply to multiple programs, which may have different terminology, there should be consistency with the terms used in the guidance. We recommend a comprehensive glossary be developed to accompany the guidance.*

Response: We plan to strengthen the glossary with additional terms. If you have specific terms that you believe should be in the glossary, please provide them to us.

- *DHSS' role in the framework of this process seems unclear upon reading Sections 7, 8, 9 and 10. The Cleanup Levels for Missouri (CALM) document clearly delineated DHSS' role in the CALM process. More discussion should be added to clarify where other agencies, such as DHSS, are included. For instance, typically a Tier 3 risk assessment work plan and risk assessment report would be reviewed by DHSS under CALM but MRBCA omits this prior role. The guidance document should be abundantly clear for remedial project managers, developers, and responsible parties. Also, new DNR personnel may not understand the role that the DHSS has in this process.*

Response: We have involved DHSS heavily in the technical development of the draft guidance. This up front involvement should minimize the review time needed from DHSS. However, we expect to continue using DHSS assistance on certain areas focused on the toxicological aspects of MRBCA evaluation such as (i) changes in toxicity factors, (ii) assessment of non-carcinogenic risk by target organ, and (iii) consideration of subchronic toxicity values.

We have had a chance to briefly look at the equations used in the MRBCA Guidance, but have never had a chance to see the software developed/provided by the RAM group. We believe that seeing this software would be beneficial to DHSS in understanding and comparing how the MRBCA process may differ from how we conduct risk assessments and develop clean-up levels. Under our present inter-agency work plan agreement, DNR is to provide software to facilitate risk assessment reviews that fall under that agreement.

Response: We are providing you with the software with the understanding that it is in draft form and will be used by DHSS for internal use only. The software will not be copied or distributed by e-mail or otherwise without the express permission of RAM Group.

Specific Comments:

Section 7.5

1) This section should reference the flowchart presented. Additionally, the flowchart and text

should correspond to one another and contain more detail, providing a step-by-step procedure for eliminating chemicals.

Response: We agree that the flowchart and text should correspond to one another and will be revised accordingly.

2) *We also recommend that a statement be included that documentation must be provided and any chemical that is eliminated be clearly identified and the reason for elimination clearly stated.*

Response: This statement is already contained in the guidance at the bottom of page 7-1: "Any data that is not used in the quantitative risk assessment must be clearly identified and the reason for its elimination determined. This information must be clearly documented in the Tiered Risk Assessment Report."

3) *We recommend for clarification that the third bullet mention that a five percent frequency of detection out of 20 samples equals one detect.*

Response: On page 7-2, Section 7.5, we will add the following sentence to the third bullet. "A 5 per cent frequency of detection implies that out of 20 samples taken one had a detected concentration and the remaining 19 are below detection limit."

4) *We recommend the following for elimination of chemicals based on blank contamination:*
   - *For Common Laboratory Contaminants – eliminate if less than ten times blank (also, provide a listing of common lab contaminants for reference)*
   - *For Chemicals that are not common lab contaminants – eliminate if less than five times blank.*

Response: We will add the following:

"Examples of common laboratory contaminants include acetone, 2-butanone, methylene chloride, toluene, and the phthalate esters. These chemicals may be eliminated if their maximum detected concentration does not exceed 10 times the concentrations observed in the QA/QC blank samples and if these constituents are known not to be site related based on the site history."

5) *In bullet #4, please define the term "published sources."*

Response: We will add the following:

"Examples of published sources include:

Tidball, Ronald R., 1984, Geochemical Survey of Missouri, Geological Survey Professional Paper 954-H,I.

Shacklette, Hansford T. and Boerngen, Josephine G., 1984, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270."

Section 7.6

6) *Prior to the toxicity screen, a statement that the risk assessor should consider re-including specific contaminants on the basis of historical data, toxicity, mobility, persistence, bioaccumulation, and special exposure routes should be added.*

Response: We do not think this statement should be added, but we can discuss further if need be.

7) *According to the Environmental Protection Agency (EPA) 1989 reference cited in this section, the toxicity screen is used for a particular medium. Summing across media is not mentioned as a part of the procedure. Please address this discrepancy.*

Response: We believe it is more appropriate to eliminate chemicals based on the total toxicity score (sum of toxicity score for each media) because the target risk criteria are based on (i) the total risk for a chemicals across all media, and (ii) the cumulative site-wide risk. Further, as is stated in Section 7.6, upon completion of the risk assessment, any chemical screened out using the toxicity screen must be reevaluated to confirm that the inclusion of the chemical will not result in an unacceptable risk. This is likely to be the case when the calculated risks are "close to" the acceptable risk levels.

8) *In Tables 7-1 and 7-2, the media described includes both soils and groundwater. However, secondary media such as sediment and surface water are not included. Also, units for chemicals should be included in the table.*

Response: Tables 7-1 and 7-2 were provided to make the guidance more user friendly in that the tables provide a simple form on which to calculate information related to toxicity screening. We will provide units in the table. In addition, we will add the following sentences into the text of this section, "If a significant portion of risk is from sediment or surface water, then the toxicity screen should consider these media. However, the specific methodology to be used shall be based on site-specific considerations and may require discussions with the department.

Section 8.0

9) *This section starts out by using the term "exposure pathway" but switches the term to "routes of exposure" and also "routes of exposure pathways." Please be consistent in the use of terms.*

Response: We will revise the guidance to use the term "exposure pathway" consistently.

10) *Section 8.4 should mention Appendix E.10, Lead Modeling, in the text.*

Response: At the end of first paragraph of Section 8.4, we will add the sentence "Note for target levels for lead refer to Appendix E.10."

11) In Section 8.4, the first sentence should say Appendix C, rather than Appendix B.

Response: This change will be made.

12) On page E.10 of the MRBCA Guidance Document, residential risked-based target levels (RBTLs) for lead are derived based on pharmacokinetic models (EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model for children between six months and seven years of age and the EPA's Adult Lead Model). Run in the reverse, these models also allow the user to calculate lead RBTLs that are considered acceptable. The equations used in Step Six were not derived to calculate risk for lead. How will this difference be addressed under this step?

Response: Step six in page E-10 refers to the back calculation of soil and groundwater target levels protective of a surface water body using a combination of Domenico and Summers models. These models are also applicable to lead. We believe no change is necessary.

13) Pages 8-7 and 8-8 discuss the calculation of "exposure pathway-specific representative concentrations." This term should be changed to "exposure point concentrations."

Response: We believe that the language that we have is correct.

14) The term "representative" should be defined to ensure that the "exposure pathway-specific representative concentration" or exposure point concentration accounts for both spatial and temporal data variance to suit the specific media contaminated and site-specific conditions.

Response: To provide more explanation, the following information will be added to Section 8.4 at the end of the section.

Appendix C contains a detailed discussion of calculating representative concentrations based on an averaging approach to chemical concentrations in environmental media. In some cases, this discussion is explicit with respect to the type of averaging that should be used (i.e., arithmetic versus weighted average) in calculating representative concentrations. In the many cases, however, Appendix C simply refers to an "average" without regard to the type. The representative concentrations used to assess human health and environmental risk should reflect the average concentrations to which receptors might reasonably be exposed across an area of impact.

The issue of average concentration is especially important to screening and evaluation of the risks associated with contaminated soils. For example, if a regular "grid" pattern (horizontal and/or vertical) has been used in the sampling of contaminated soil across an area of impact, then use of an arithmetic average soil concentration as the representative concentration is generally appropriate (assuming the grid pattern established over the area of impact is fine enough). If biased soil sampling is performed (as is often the case); it may be necessary to calculate an area-weighted average concentration as an estimate of the representative concentration to offset the effects of the biased sampling. For example, a contaminated area

with one or two samples in the area of highest impact and many samples near the margin of the area of impact could unfairly bias the representative concentration on the low side if the arithmetic average of the results is used. In this case, each sample should probably not be accorded the same "weight" in calculating the average that will serve as the representative concentration for screening and/or risk evaluation. There are several techniques that can be used to come up with an area weighted average for use as the representative concentration. These techniques range from hand calculation using the measured contaminant concentrations coupled with designated "areas" based on best professional judgement to fully automated calculations using available computer software using geostatistical techniques. Ultimately, prior to calculating area-weighted averages, the remediating party should discuss the specifics of the procedure to be used with the project manager.

15) *Formula 8-2b sums up the hazard index for all of the associated pathways for a given chemical. This procedure may not be appropriate for a particular chemical because different pathways may produce a different endpoint. For example, chemical X has a* reference dose based on chronic oral exposure (*RfDo) studies that mention the liver and kidneys as end points, while its inhalation reference dose concentration (RfC) is developmental. This may or may not be additive.*

Response: The concept is presented in the opening paragraph of Section 8.7. However, we will add the following at the end of the first full paragraph in Section 8.7.

"This concept of adding hazard quotients for only those chemicals or routes of exposure that result in similar toxicological impacts is applicable to all instances when a hazard index is being calculated."

Section 9.0

16) *In Section 9.1, the term "sensitivity analysis" is used. For clarity, this term should be defined, including reference to any source document outlining the procedure required to perform such analysis.*

Response: This term will be added to the list of definitions and defined as such, "Evaluation of the calculated risk or target levels for different alternatives of possible input parameters." Many references exist to describe the process of sensitivity analysis procedures and we believe that the specific sensitivity analysis to be conducted will be part of a site-specific evaluation.

17) *In Section 9.1.1, Depth to Subsurface Soil Sources (d_{ts}), the sentence reads, "A reasonable value would be a concentration weighted average depth." Removing this sentence would help clearly define the project manager's choices. The sentence prior to this comment seems to adequately define the acceptable choices.*

Response: We will remove this sentence.

18) *In Section 9.1.1, Thickness of Capillary Fringe (h_c), it is assumed that the thickness of the capillary fringe (zone) will be added to the total depth from grade in order to determine the*

depth to contaminated groundwater. According to the EPA Johnson/ Ettinger (JE) vapor intrusion model, the thickness of the capillary zone is known to be as thick as one hundred ninety-two centimeters (192 cm) for silty clay soils. Because this zone is initially not considered contaminated, which directly retracts from the parameter for the thickness of the vadose zone (h_v) as well as depth to the source (d_{ts}), more discussion should be given for estimating this parameter when the potential for non-aqueous phased or free-phase liquids may be present.

Response: The Johnson & Ettinger model assumes that the capillary fringe zone is unimpacted; this assumption does not always correspond to actual conditions. However, the Workgroup had previously decided to adopt the capillary fringe thickness from the CALM document, which is 5 cm.

19) In Section 9.1.1, Groundwater Mixing Zone Thickness, the symbol used to denote this parameter could not be found in any of the formulas.

Response: This parameter is used in the equation entitled "Leaching Factor from Subsurface Soil to Groundwater" on Page E-50 and the symbol will be added.

20) In Section 9.3, bullet four, the term "toxicologist" is used. A definition of toxicologist including any professional requirements should be included in the guidance.

Response: We will add the following description: "A toxicologist is a professional knowledgeable about the adverse health effect of chemicals on human beings and application of quantitative toxicity factors in risk assessment. The knowledge may be a result of formal education, participation in continuing education courses or professional experience."

21) In Section 9.4, Analytical Detection Limits, Item 3 uses the term "maximum detection limit." This term is not consistent with common detection and quantitation limit terminology and is confusing. We recommend using terminology consistent with Environmental Protection Agency's Guidance for Data Useability in Risk Assessment (Part A), Publication 9285.7-09A, PB92-963356, April 1992.

Response: We will revise the sentence to read, "This approach could involve the use of a detection-based scenario (i.e., using the highest detection limit that was available in the historic data for the COCs) in conjunction with alternate site-specific exposure factors to calculate if the risk is acceptable."

22) *In Section 9.5, Step 4: Recommend the Next Course of Action, the Action vs. Calculated Risk, the table uses column headings "Individual" and "Cumulative." This is not descriptive of the category. Additional wording such as "Individual Chemical of Concern" and "Cumulative, Site-Wide Risk" would be more descriptive.*

Response: We will change these column headings.

Section 10

23) Section 10.0 did not include steps to evaluate the indoor air pathway. We found this pathway in the Appendix C. 2.2.2 of the MRCBA document, but Section 10.0 does not mention it.

Response: A Tier 3 evaluation will include the analysis of all complete routes of exposure, including indoor air.

24) Section 10.1 uses the term, "technically defensible" to describe the use of alternative fate and transport models. How are fate and transport models to be technically defensible? If they are peer reviewed, are they not defended in that fashion? What criteria will DNR use to evaluate these models?

Response: The criteria are located in Section 10.1.

25) Section 10.1 mentions the use of subchronic toxicity values for non-carcinogenic effects when exposure is less than seven years The text should mention that subchronic toxicity values are not as widely available as chronic values, and unlike chronic reference dose values (RfDs) and reference dose concentration values (RfCs), no EPA work group exists to review and verify subchronic RfDs or RfCs. Subchronic toxicity values for a limited number of compounds are available from EPA's Health Effects Assessment Summary Tables (HEAST). The Agency for Toxic Substances and Disease Registry (ATSDR) publishes Minimal Risk Levels (MRLs) that may be suitable for use as subchronic toxicity values.

Response: In the text after the bullet when it refers to subchronic values we will add the following: "Note that subchronic toxicity values are not as widely available as chronic values, and unlike chronic reference dose values (RfDs) and reference dose concentration values (RfCs), no EPA work group exists to review and verify subchronic RfDs or RfCs. Subchronic toxicity values for a limited number of compounds are available from EPA's Health Effects Assessment Summary Tables (HEAST). The Agency for Toxic Substances and Disease Registry (ATSDR) publishes Minimal Risk Levels (MRLs) that may be suitable for use as subchronic toxicity values."

26) EPA's Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (December 2002) provides separate volatilization factor (VF) and particulate emission factor (PEF) equations for construction scenarios with subchronic exposure, where 1996 Soil Screening Guidance are intended for residential and commercial/industrial scenarios with chronic exposure. This distinction should be made clear in this section of the guidance.

Response: We will make this distinction clear in the guidance.

27) Section 10.0 did not include a discussion about the non-standard method of calculating risk for lead.

Response: In Section 10.1, we will add the following bullet:

- As discussed in Appendix E.10, the IEUBK model may be used to develop site-specific target levels for lead.

28) Section 10.4 mentions the use a toxicologist to perform analysis of segregating the chemicals of concern by target organ. Categorizing chemicals into groups requires a search through literature sources that are readily available to many people via the Internet. This information is well organized, and if someone who has some knowledge of toxicology were to review toxicology information, he/she would be capable of categorizing the chemicals by their health effects. Please describe how these specialists are more preferable.

Response: We will add the following: "A chemical may cause adverse health effects to multiple organs or may cause adverse effects to an organ by different mechanisms, hence it is not straight forward to categorize chemicals of concern by target organs. Hence it is necessary that such an evaluation be performed by a toxicologist as defined earlier."

Appendix B

29) Table B-1, B-2, B-3, and B-4. To eliminate confusion, the use of the lowest default target levels and the default target levels (soil-type specific) should be described in the text, preferably in Section 7.0. It appears that Section 2.0 provides an overview of these risk assessment options. Providing a more complete description of each tier and detailing each step in the process by relating it back to Figure 2-2 MRBCA Process Flowchart, would clarify this and aid the reader in understanding the process.

Response: The use of Default Target Level tables for each soil type has apparently caused confusion. In response to comments, we plan to eliminate Tables B-2, B-3, and B4. Thus the guidance document will not include soil-specific DTLs.

Appendix C

This section is poorly cited in Sections 7, 8, 9 and 10. We think logical reference to portions of Appendix C, as needed, should be included in these important sections.

Response: We will add cross references as follows:

pp 10-2 At the end of bullet 5
pp 8-1 Line 4 after representative concentration, add "refer to Appendix C for a discussion of the representative concentrations."
pp 9-7 At the end of 2nd sentence in Section 9.2, add "Calculation of risk will require the estimation of representative concentration as discussed in Appendix C."

Appendix E

Table E1, Toxicity Value of Chemicals

30) Because the EPA is the deciding authority for carcinogenic effects, the column Cancer Group title should include the acronym EPA.

Response: The title will be changed to read "EPA Cancer Group."

31) For the purpose of calculating risk additivity, a table should be provided that includes the endpoints (target organs) associated with the toxicity values.

Response: It is not practical or very useful to have such a table because this information will change over time and should be part of the site specific toxicological assessment.
Response to Comments 32-51 below: We have checked on all of the comments below, and found information pertinent to six chemicals that needed to be revised. These chemicals, revisions, and resulting values and target levels are contained in Table 1, provided in a separate file attachment.

32) For 2-methyl-4,6-dinitrophenol, an EPA provisional peer-reviewed toxicity value (PPRTV) for the oral reference dose (RfDo) of 1.0E-04 mg/kg day should be considered versus the MRBCA value of 2.0E-03 mg/kg day. MRBCA's value is derived from a tertiary source; Texas Risk Reduction Program (TRRP) Tier 1 protective concentration level (PCL) table.

33) For 1,2-dibromo-3-chloropropane, a reference dose for inhalation (RfDi) value of 5.7E-06 mg/kg day from EPA's Integrated Risk Information System (IRIS) is available. MRBCA lists the value at 6.9E-05 mg/kg day, also noted as an IRIS value.

34) For 2-Nitrotoluene, the EPA's Health Effects Assessment Summary Table (HEAST) provides a similar value for the RfDo. HEAST would be a better reference than the TRRP guidance.

35) It appears that the RfDi for 3-nitrotoluene extrapolated from an RfDo is not from PPRTV, but from HEAST. Please review and revise the MRBCA document accordingly.

36) For 1,1-dichloroethane, National Center for Environmental Assessment (NCEA) papers utilize an RfDi of 1.4E-02 mg/kg day. MRBCA lists a HEAST value of 1.4E-01. The listing found in the July 1997 version of HEAST, page 1-37 lists a chronic RfD for inhalation as 1.0E-01 mg/kg day. Please justify the use of value provided in MRBCA.

37) For 1,2-dichlorobenzene, MRBCA lists the RfDi as 5.7E-02 mg/kg day from HEAST. This value could not be found in the 1997 HEAST table. Please review to determine if this is the correct reference.

38) According to Risk Assessment Issue Paper for Derivation of Provisional Chronic RfDs for n-Butyl benzene (Chemical Abstract Service Registration Number (CASRN) 104-51-8), sec-Butyl benzene (CASRN 135-98-8), tert-Butylbenzene (CASRN 98-06-6), and n-Propylbenzene (CASRN 103-65-1), the provisional oral RfD for n-butyl benzene, n-propylbenzene, sec-butyl benzene and tert-butylbenzene would be 1E-2 mg/kg day.

39) For the polychlorinated biphenyls (CASRN 1336-36-3), IRIS suggests the use of 1.0E-01 mg/m^3 as a unit air risk. Converted, the slope factor for inhalation (SFi) is 3.5E-01 $(mg/kg\ day)^{-1}$. MRBCA suggests the use of 2.0 $(mg/kg\ day)^{-1}$ for Aroclor 1221, Aroclor 1242, Aroclor 1248, Aroclor 1254, and Aroclor 1260. IRIS provides an SFi of 3.5E-01 for Aroclor

1260 and for all of the Aroclors listed, an SFi of 4.0E-01 is provided. A review of the current toxicity data within IRIS is recommended to support MRBCA's toxicity values.

40) DHSS could not locate the following HEAST toxicity value: Allyl chloride (107-05-1), RfDo of 5.0E-02 mg/kg day. Please review HEAST and NCEA for more information to support this value.

41) DHSS could not verify the following California Environmental Protection Agency (CalEPA) toxicity value: Bromodichloromethane SFi and the oral slope factor (Sfo) for 1,4-dichlorobenzene. Please review CalEPA toxicity records for more information to support this value.

42) DHSS could not verify the following NCEA values: 1,2-dichlorobenzene RfDo of 9.0E-04 mg/kg day, 1,3-dichlorobenzene RfDo, and 1,4 dichlorobenzene RfDo. Please review NCEA records for more information to support these values.

43) The SFo for 1,4-dichlorobenzene in HEAST is 2.4E-02 $(mg/kg\ day)^{-1}$. Please review and revise the MRBCA document accordingly.

44) The SFi for 1,2-dichloropropane in CalEPA is 3.6E-02 $(mg/kg\ day)^{-1}$. Please review and revise the MRBCA document accordingly.

45) For tetrachloroethylene, CalEPA lists an SFo as 5.4E-01 and a SFi as 2.1E-02 $(mg/kg\ day)^{-1}$. Please review and revise the MRBCA document accordingly.

46) For bis(2-ethylhexyl)phthalate, a SFi of 1.1E-06 $(mg/kg\ day)^{-1}$ from NCEA Risk Assessment Issue Papers from 9/20/95 is available. Please review and revise the MRBCA document accordingly.

47) For 2,4-dinitrotoluene, the cancer group needs to be B2 according to CalEPA's reference notes.

48) For carbazole, the cancer group is a B2 according to HEAST. Please review and revise the MRBCA document accordingly.

49) For 3-nitroaniline, according to PPRTV, the RfDi should be 3.0E-04 mg/kg day, not 2.9E-04 mg/kg day. Please review and revise the MRBCA document accordingly.

50) For alpha-hexachlorocyclohexane, the extrapolation from RfDo to RfDi is one order of magnitude greater according to DHSS calculations. Please review and revise the MRBCA document.

51) For chlorothalonil, the SFo used by MRBCA is less conservative than HEAST's value of 1.1E-02 $(mg/kg\ day)^{-1}$. Please review and revise the MRBCA document accordingly.

Table E.2

52) Table E.2 uses the EPA Region IX, Preliminary Remediation Goals InterCalc Tables: Physical-Chemical Data dated October 1, 2002. There was an update of these tables in October 2004. Please check these tables to be sure the most recent information is being used.

Response: The updated information on pertinent chemicals is also provided in Table 1, provided in a separate file attachment.

53) Equations used in Appendix E for dermal contact to surface soil and groundwater reference the Environmental Protection Agency's Risk Assessment for Superfund (RAGS), Volume I, Part A, 1989. Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment should be used, as it is the most current guidance for dermal absorption. RAGS, Part E utilizes the dermally absorbed dose per event (DA $_{event}$) factor, which provides an estimate of total dose dissolved in the two main layers of the skin at the end of the exposure. We recommend that DNR use RAGS, Volume I, Part E, 2001, Appendix D, page D-2 for organic chemicals in water.

Response: The newest RAGS Guidance to which you refer was published after the Workgroup meetings had agreed to use the previous guidance, so we continued to use what was recommended by the Workgroup. However, in the interest of using the newest scientific information, we will bring this discussion back before the Workgroup at the April 28 meeting.

Table E.3, Exposure Factors

54) The following revisions to Table E.3 were discussed within workgroup sessions with DNR. These recommended values are more representative of a reasonable maximum exposure (RME) scenario for the associated receptors. The RME scenario is important because RME estimates a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures. Instead of combining many sources of uncertainty into average and upper-bound exposure estimates, the variation in individual exposure variables is used to evaluate uncertainty. We would like DNR to re-consider the following exposure factors that we have researched and think are more representative of each receptor:

Response: This comments and those below that are associated with it will be evaluated after the USEPA's comments have been received.

1. *Soil Ingestion Rate for the Construction Worker -- change from 100 mg/day to 330 mg/day (Source: Exhibit 1-2 (page 1-5) of the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (OSWER 9355.4-24, December 2002)). This accounts for the intensive soil contact that may be assumed in a construction worker scenario.*

2. *In previous discussions with DNR, we had recommended inhalation exposure rates that were higher than those represented in Table E.3. We are not recommending indoor or outdoor inhalations rates at this time because values in Table E.3 are satisfactory for current central tendency exposures. When developing a risk assessment under Tier 3 with a future scenario, we think the guidance should provide provisions for inhalation rate values that are more representative of reasonable maximum exposure (RME). The existing exposure values in Table E.3 will not fit every scenario.*

3. *Skin Surface Area Exposed to Soil for the following;*
    a. *Resident Child – change from 4,263 cm^2/day to 2,800 cm^2/day,*
    b. *Resident Adult -- change from 4,714 cm^2/day to 5,700 cm^2/day, and*
    c. *Non-Residential Worker and Construction Worker -- change from 4,714 cm^2/day to 3,300 cm^2/day (see the table (Exhibit 3-5) below from Page 3-20 of EPA RAGS, Part E);*

4. *Soil to Skin Adherence Factor for the following;*
    a. *Resident Child -- change from 1 mg/cm^2 to 0.2 mg/cm^2,*
    b. *Resident Adult -- change from 1 mg/cm^2 to 0.07 mg/cm^2,*
    d. *Non-Residential Worker -- change from 1mg/cm^2 to 0.2 mg/cm^2 (see the table (Exhibit 3-5) below from Page 3-20 of EPA RAGS, Part E); and*
    c. *Construction Worker -- change from 1 mg/cm^2 to 0.3 mg/cm^2 (see the table (Exhibit 3-3) from Page 3-18 of EPA RAGS, Part E)*

EXHIBIT 3-5

RECOMMENDED DERMAL EXPOSURE VALUES FOR CENTRAL TENDENCY AND RME RESIDENTIAL AND INDUSTRIAL SCENARIOS – SOIL CONTACT

Exposure Parameters		Central Tendency		RME Scenario	
		Residential	Industrial	Residential	Industrial
Concentration- C_{soil} (mg/kg)		site-specific values			
Event frequency (events/day)		1	1	1	1
Exposure frequency (days/yr)		site-specific	219	350	250
Exposure duration (yr)		9	9	30	25
Skin surface area (cm^2)	Adult	5,700	3,300	5,700	3,300
	Child	2,800	NA	2,800	NA
Soil adherence factor (mg/cm^2)	Adult	0.01	0.02	0.07	0.2
	Child	0.04	NA	0.2	NA
Dermal absorption fraction		chemical-specific values (Exhibit 3-4)			

NA: not applicable

5. *We recommend the addition of a new category titled Skin Surface Area Exposed to Water to include the following receptors and exposure factors: a) Residential Adult –18,000 cm^2, and b) Residential Child -- 6,600 cm^2. These values should be considered for*

residential showering/bathing scenarios (See Exhibit 3-2 page 3-8 of EPA RAGS, Part E (EPA OSWER 9285.7-02EP, July 2004).

Response: At the time when the guidance was developed, EPA's RAGS Part E Supplemental Guidance for Dermal Risk Assessment was not available. However, it was decided not to include the dermal contact with water in a residential water use scenario. Note this scenario is used to estimate concentration in water that is protective of the domestic use for chemicals without MCLs.